I simulated infiltration in a silty soil with Hydrus and used the following parameters of the van Genuchten model:

θr	θs	α (1/cm)	n	Ks (cm/d)	l
0.034	0.46	0.016	1.37	6	0.5

Infiltration was simulated in a soil profile with an initially uniform pressure heads. Initial pressure heads of -200, -500, -1000 and -5000 cm were considered. A constant head infiltration (h= 0 cm) at the surface was considered.

The simulated cumulative infiltration curves were subsequently used to fit the Green Ampt infiltration model (GA model).

$$I(t) = K_s t + (\theta_s - \theta_{ini})|h_f| \ln\left(\frac{I(t)}{(\theta_s - \theta_{ini})|h_f|} + 1\right)$$

This model was rewritten so that the time is the dependent variable and the cumulative infiltration the independent variable. Parameters were then fitted by minimizing the squared difference between the Hydrus simulated times and the times predicted by the GA model. Three different fitting scenarios were considered:

1) Both Ks and hf were fitted
2) Ks was fitted and hf was assumed to be equal to the initial pressure head
3) hf was fitted and Ks was put equal to Ks used in the Hydrus simulations

Option 2 is what I presume is implemented in EROSION 2/3D and what the authors used to analyze the infiltration curve.

What can be observed is that:

1) Option 1 and 3 fit the simulated curves better than option 2
2) When option 1 and 3 are used, the fitted hf is much smaller (in absolute value) than the initial pressure head vary only little with the initial pressure heads.
3) When option 2 is used, the fitted saturated conductivity decreases drastically with drier initial soil conditions and are much smaller that the true Ksat. This is what the authors also observe but attribute it to a decreased conductivity of a dry soil and the formation of a skin layer. The simulation results in fact show that this is incorrect interpretation of infiltration is soils.
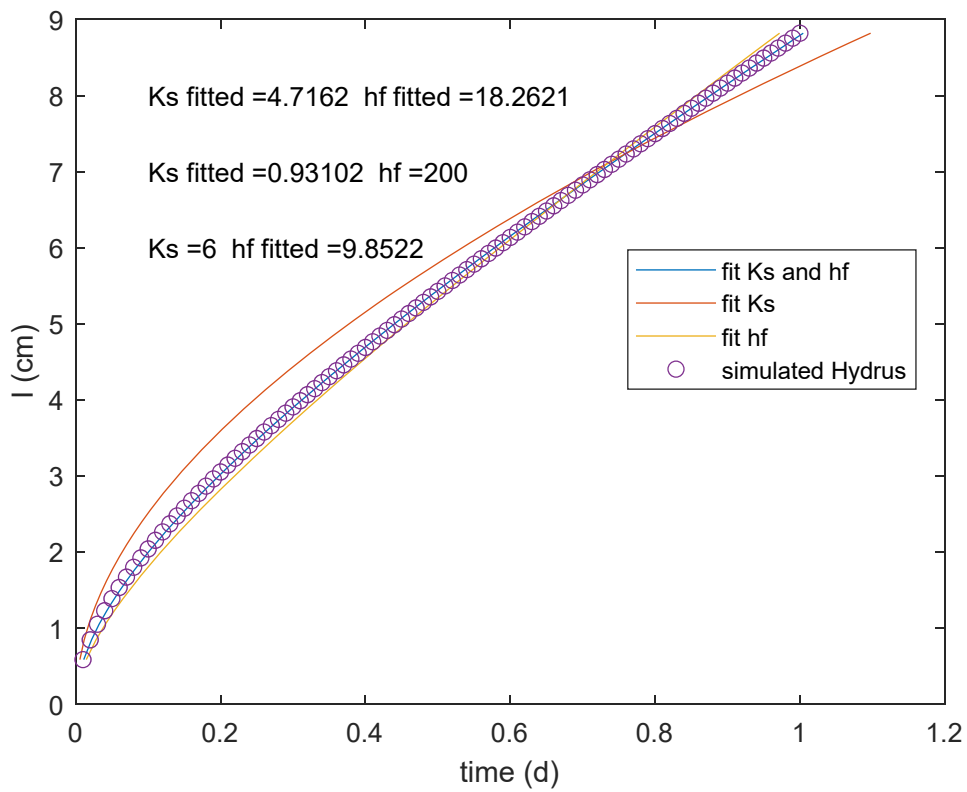
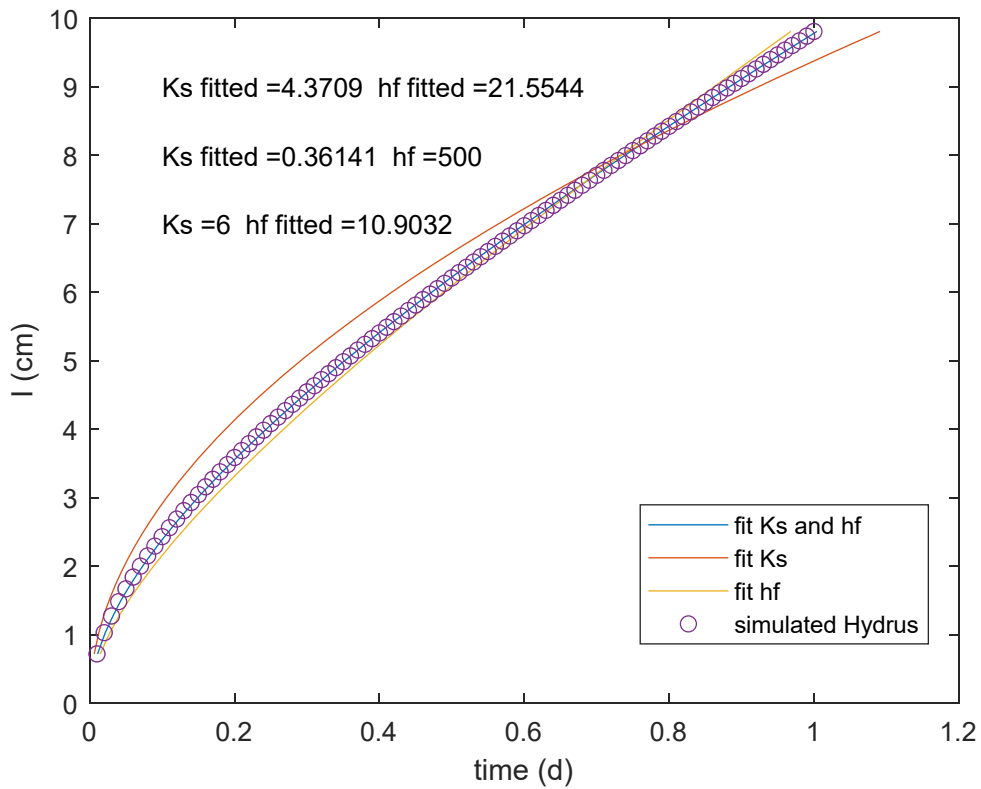*Figure 1: Infiltration curve for an initial pressure of -200 cm*

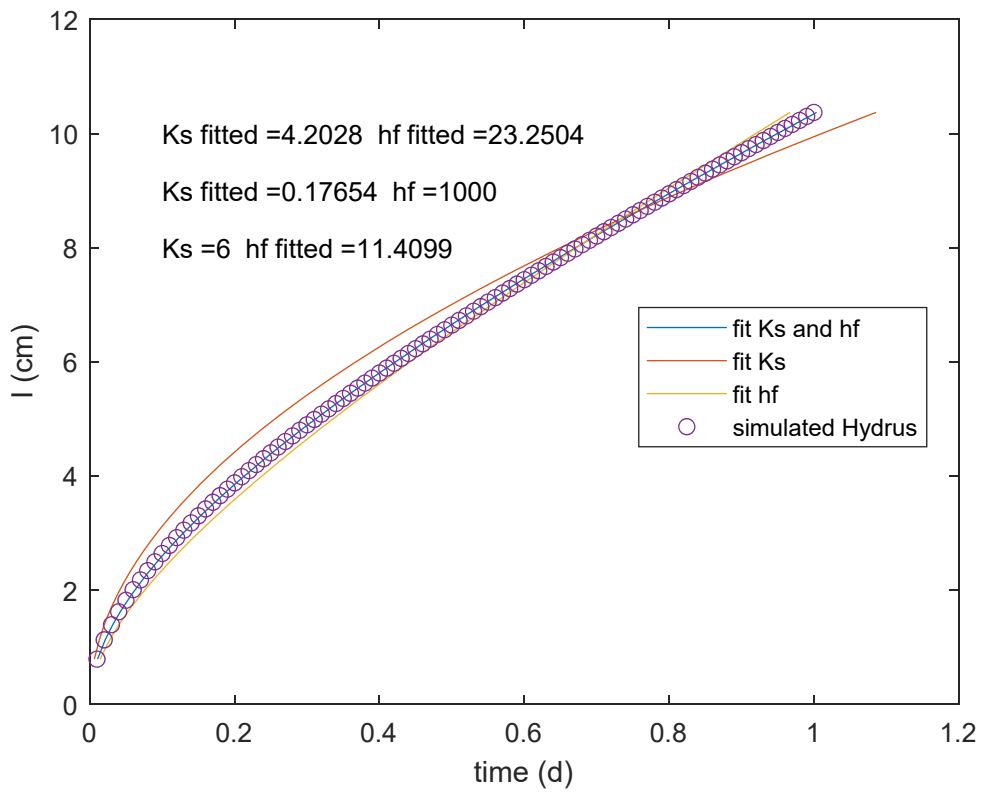*Figure 2: Infiltration curve for an initial pressure of -500 cm*

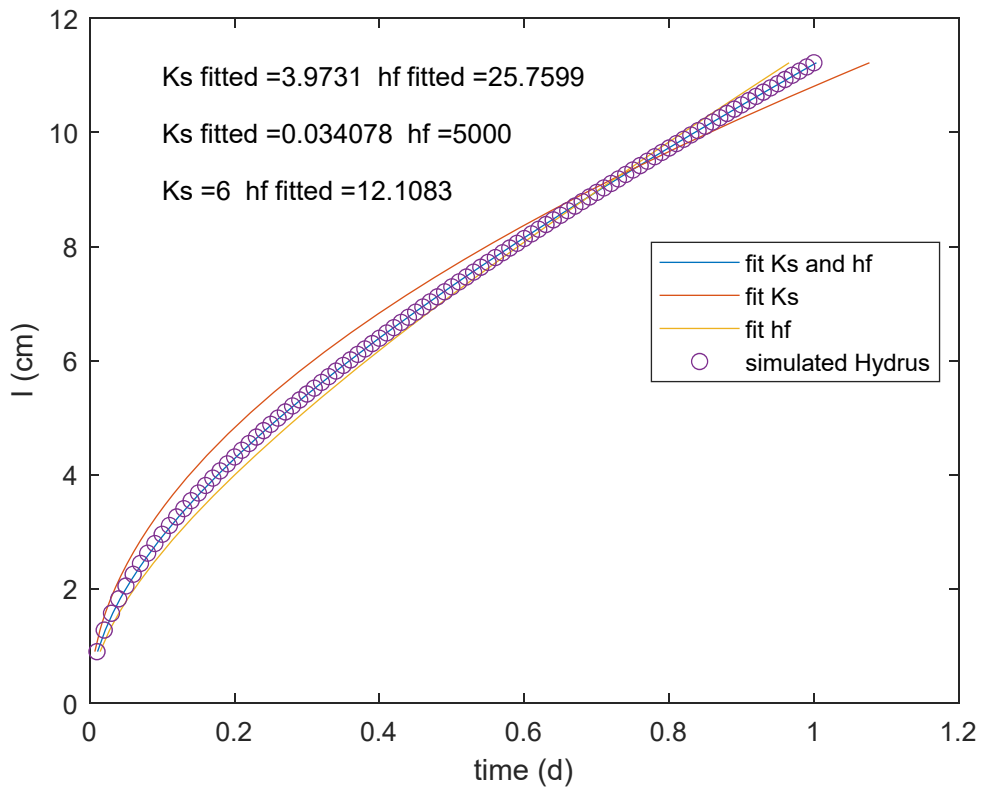*Figure 3: Infiltration curve for an initial pressure of -1000 cm*

Figure 4: Infiltration curve for an initial pressure of -5000 cm